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ART UNIT	PAPER NUMBER
2683	

DATE MAILED: 03/11/2004 IH

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/576,999	MUJTABA ET AL.	
	Examiner	Art Unit	
	Meless N Zewdu	2683	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *18 February 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-39* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-10,12-23,25-36,38 and 39* is/are rejected.

7)☒ Claim(s) *11, 24 and 37* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment (RCE)

1. This action is in response to the communication filed on 2/18/04.

2. Claims 1-39 are pending in this action.

3. Change in ground of rejection was necessitated by applicant's amendment of the claims.

Claim Objections

Claims 4, 17 and 30 are objected to because of the following informalities: claims 4 17 and 30, which depends on claims 1, 14 and 27 respectively recite "N-dimensional array for **each micro-cell** within the macro-cell" whereas only one or "an active micro-cell" is provided in claims 1, 17 and 30. The phrase "each microcell" infers that more than one microcells are defined in claims 1, 14 and 30, which is not the case. Appropriate correction is required.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1, 14 and 27 respectively recite the limitation " --- the active macrocell; --- the at least one active microcell, within the active macrocell; --- the active macrocell" in

lines 4-5; 6-7 and 5 respectively. There is insufficient antecedent basis for this limitation in the claims. In other words, **active** micro or macro cells were not mentioned or defined so as to support such structures/constructions of claims.

Claim Rejections - 35 USC § 103

I. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

II. Claims 1, 2, 4, 14, 15, 17, 27, 28 and 30 rejected under 35 U.S.C. 103(a) as being unpatentable over Fujii et al. (Fujii) (US 5,551,060) in view of Keskitalo et al. (Keskitalo) (US 6,091,788).

As per claim 1: the claimed feature is directed to a base station, servicing a macrocell, comprising, at least one steerable N-dimensional antenna (N ≥2) array co-located with an antenna of said base station, for serving a microcell within the macrocell. To that effect, Fujii discloses a hierarchical cellular network wherein a first small cell/micro-cell underlies a second small cell/macro-cell both of which are served by a single base station located at the center of the first small cell and includes a first and a second antenna directional antennas (see figs. 5B; 6A-7A; 8-16B; col. 2, lines 16-43; col. 4, lines 21-29; col. 6, lines 19-67). As can be seen from the figures and read from the disclosure, Fujii's first and second cells can be interpreted as micro and macro-cells. Furthermore, both the micro-cell and macro-cell are being served by two antennas co-

located at same base station. But, Fujii does not explicitly teach about at least one steer-able N-dimensional (N ≥2) array, as claimed by applicant. as called for by the claims. However, in a related field of endeavor, Keskitalo teaches about steering an antenna beam in a base station equipment wherein the antenna array consists of a plurality of several elements (see col. 3, line 32-col. 4, line 18) wherein the elements may be linear, planar (two-dimensional) or omni-directional (see col. 15, line 55-col. 16, line 20). Therefore, it would have been obvious for one of ordinary skill in the art at the time the invention was made to modify the Fujii reference with the teaching of Keskitalo for the advantage of steering the antenna beams to a desired direction (see col. 4, lines 10-18).

As per claim 2: the base station wherein said at least one steer-able N-dimensional array serving the micro-cell is co-located on an antenna tower with an antenna serving the macro-cell reads on '060 (see col. 2, lines 25-43). When the references are combined as discussed in the rejection of claim 1, the second smaller cell antenna that is co-located with the first small cell antenna (provided by Fujii) will have Keskitalo's two-dimensional array.

As per claim 4: the base station, wherein said base station includes a steer-able N-dimensional (N ≥ 2) array for each micro-cell within the macro-cell reads on '788 (see col. 3, line 32-col. 4, lines 64; col. 15, lines 55-66). When the references are combined as discussed in the rejection of claim 1, above, the base station will include a steer-able two-dimensional N-dimensional array for each micro-cell within the macro-cell provided in Fujii's hierarchical cell structure.

As per claim 14: a method of servicing at least one microcell in a macrocell, comprising:

co-locating a microcell antenna on the same antenna tower with an antenna of said base station of a macrocell reads on '060 (see fig. 5B; 6A-16C; col. 2, lines 25-43; col. 6, lines 19-67). But, Fujii does not explicitly teach about at least one steer-able N-dimensional (N ≥ 2) array antenna the resultant beam of which can be steered toward the at least one active microcell, within the active the active macrocell, as claimed by applicant. However, in a related field of endeavor, Keskitalo teaches about steering an antenna beam in a base station equipment wherein the antenna array consists of a plurality of several elements (see col. 3, line 32-col. 4, line 18) and wherein the elements may be linear, planar (two-dimensional) or omni-directional (see col. 15, line 55-col. 16, line 20). Furthermore, Keskitalo provides signal multiplication with complex coefficients for producing a resultant beam (see col. 10, line 62-col. 11, line 7). Therefore, it would have been obvious for one of ordinary skill in the art at the time the invention was made to modify the Fujii reference with the teaching of Keskitalo for the advantage of steering the antenna beams to a desired direction (see col. 4, lines 10-18).

As per claim 15: the method wherein said at least one steer-able N-dimensional array serving the micro-cell is co-located on an antenna tower with the antenna serving the macro-cell reads on reads on '060 (see col. 2, lines 25-43). When the references are combined as discussed in the rejection of claim 1, the second smaller cell antenna that is co-located with the first small cell antenna (provided by Fujii) will have Keskitalo's two-dimensional array.

As per claim 17: the method wherein said co-locating step includes co-locating a steer-able N-dimensional (N ≥ 2) array with the base station for each microcell within the macro-cell reads on reads on '788 (see col. 3, line 32-col. 4, lines 64; col. 15, lines 55-66). When the references are combined as discussed in the rejection of claim 1, above,

the base station will include a steer-able two-dimensional N-dimensional array for each micro-cell within the macro-cell provided in Fujii's hierarchical cell structure.

As per claim 27: a base station, servicing a macro-cell, comprising:

Co-locating a micro-cell antenna on same antenna tower with an antenna of a base station of a macro-cell reads on '060 (see fig. 5B; 6A-16C; col. 2, lines 25-43; col. 6, lines 19-67). But, Fujii does not explicitly teach about at least a steer-able N-dimensional ($N \geq 2$) array means on a micro-cell base-station antenna that serves an active micro-cell within an active macro-cell, as claimed by applicant. However, in a related field of endeavor, Keskitalo teaches about steering an antenna beam in a base station equipment wherein the antenna array consists of a plurality of several elements (see col. 3, line 32-col. 4, line 18) and wherein the elements may be linear, planar (two-dimensional) or omni-directional (see col. 15, line 55-col. 16, line 20). Therefore, it would have been obvious for one of ordinary skill in the art at the time the invention was made to modify the Fujii reference with the teaching of Keskitalo for the advantage of steering the antenna beams to a desired direction (see col. 4, lines 10-18).

As per claim 28: the base station wherein said steer-able N-dimensional array means serving the micro-cell is co-located on an antenna tower with the antenna serving the macro-cell reads on reads on '788 (see col. 3, line 32-col. 4, lines 64; col. 15, lines 55-66). When the references are combined as discussed in the rejection of claim 1, above, the base station will include a steer-able two-dimensional N-dimensional array for each micro-cell within the macro-cell provided in Fujii's hierarchical cell structure.

As per claim 30: the base station wherein said base station includes steer-able N-dimensional array means for each micro-cell within the macro-cell reads on '788 (see col. 3, line 32-col. 4, lines 64; col. 15, lines 55-66). When the references are combined as discussed in the rejection of claim 1, above, the base station will include a steer-able

two-dimensional N-dimensional array for each micro-cell within the macro-cell provided in Fujii's hierarchical cell structure.

III. Claims 3, 8, 16, 21, 29 and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fujii in view of Keskitalo as applied to claims 1, 14 and 27 above, and further in view of Raith et al. (Raith) (US 5,818,829).

As per claim 3: Fujii in view of Keskitalo do not explicitly teach about a base station, wherein the micro-cell includes a hot spot, as claimed by applicant. However, in a related field of endeavor, Raith teaches about a hierarchical cellular communication system using technique of hybrid multiple access for increasing throughput capacity wherein an umbrella macro-cell includes micro-cells that could represent picocells, or traffic hot spots (see col. 1, lines 6-17; col. 5, lines 41-67). Therefore, it would have been obvious for one of ordinary skill in the art at the time the invention was made to further modify the above references with the teaching of Raith for the advantage of handling different traffic patterns or radio environments where the macro-micro cellular structures may be distinct from one another or overlay one another (see col. 5, lines 52-55).

As per claim 8: the base station wherein said at least one steer-able N-dimensional ($N \geq 2$) array serves a hot spot reads on '829 (see col. 5, lines 41-67). When the references are combined as discussed above (claim 3), Raith's traffic hot spot will be served by the two dimensional array discussed in the rejection of claim 1.

As per claim 16: the method wherein the micro-cell includes a hot spot reads on '829 (see col. 1, lines 6-17; col. 5, lines 41-67).

As per claim 21: the method wherein the at least one steer-able N-dimensional array serves a hot spot reads on '829 (see col. 5, lines 41-67). When the references are

combined as discussed above (claim 3), Raith's traffic hot spot will be served by the two dimensional array discussed in the rejection of claim 1.

As per claim 29: the base station wherein the micro-cell includes a hot spot reads on '829 (see col. 1, lines 6-17; col. 5, lines 41-67).

As per claim 34: the base station wherein said steer-able N-dimensional (N ≥2) array means serves a hot spot reads on '829 (see col. 5, lines 41-67). When the references are combined as discussed above (claim 3), Raith's traffic hot spot will be served by the two dimensional array discussed in the rejection of claim 1.

IV. Claims 12, 13, 25, 26, 38 and 39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fujii in view of Keskitalo as applied tomclaims 1, 14 and 27 above, and further in view of Raith (a different version).

As per claim 12: but, Fujii in view of Keskital do not explicitly teach about a base station, wherein said base station is part of a TDMA system and the macro-cell and micro-cell are separated in one of the frequency and code domains, as claimed by applicant. However, in a related field of endeavor, Raith teaches about an access technique wherein FDMA (frequency division multiple access), TDMA (time division multiple access) , CDMA (code division multiple access) and hybrid FDMA/TDMA/CDMA can be used (see col. 1, lines 6-17). Therefore, it would have been obvious for one of ordinary skill in the art at the time the invention was made to modify the above references with the teaching of Raith for the advantage of increasing throughput capacity of mobile stations.

As per claim 13: the base station, wherein said base station is a part of CDMA system and the macro-cell and the micro-cell are separated in on of the frequency and code domain reads on '829 (see col. 1, lines 6-17).

As per claim 25: the method wherein the base station is part of a TDMA system and the macrocell and the microcell are separated in the frequency domain reads on '829 (see col. 1, lines 6-17).

As per claim 26: the method wherein the base station is part of a CDMA system and the macro-cell and the micro-cell are separated in on of the frequency and the code domain reads on '829 (see col. 1, lines 6-17).

As per claim 38: the base station wherein said base station is part of a TDMA system and the macro-cell and the micro-cell are separated in the frequency domain reads on '829 (see col. 1, lines 6-17).

As per claim 39: the base station wherein said base station is part of a CDMA system and the macro-cell and the micro-cell is separated in one of the frequency and the code domains reads on '829 (see col. 1, lines 6-17).

V. Claims 5-6, 10, 18-19, 23, 31-32 and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fujii in view of Keskitalo as applied to claims 1, 14 and 27 above, and further in view of Velazquez et al. (Velazquez) (US 6,593,880 B2).

As per claim 5: the base station wherein said at least one steerable N-dimensional array further includes:

at least two antenna elements reads on '060 (see col. 4, lines 21-29). But, Fujii in view of Keskitalo do not explicitly teach about an N-dimensional digital filter for receiving inputs from the at least two antenna elements and processing the inputs to produce a beamformed output, as claimed by applicant. However, in a related field of endeavor, Velzauez teaches about an M-element adaptive antenna array and beamformer wherein each element of the antenna is provided with N adaptive linear filters adapted in real time to form a beam to and from each mobile unit (see col. 4, lines 23-62,

particularly lines 23-33; col. 7, lines 25-40; col. 11, line 12- col. 12, line 43; also see claims 1, 8, 17, 25, 45 and 72). Therefore, it would have been obvious for one of ordinary skill in the art at the time the invention was made to further modify the above references with the teaching of Velazquez for the advantage of deterministically modify the wireless signal beam between transceivers (see col. 2, lines 38-45).

As per claim 6: the base station wherein the at least one inputs and outputs of said at least two antenna elements are weighted to steer a resultant output beam of said at least one steerable N-dimensional array reads on '880 (see col. 13-30; col. 13, line 52-col. 14, line 10).

As per claim 10: the base station wherein said at least two antenna elements are arranged in two-dimensional plane or on a surface of a cylinder reads on '788 (see col. 15, line 55-col. 16, line 13).

As per claim 18: the method wherein the at least one steerable N-dimensional array includes at least two antenna elements reads on '060 (see col. 4, lines 2129). When the Fujii's antenna elements are modified by Keskitalo, as described in claim 1, 14 and 27, above, the antenna elements will have at least two dimensions. But, Fujii in view of Keskitalo do not explicitly teach about an N-dimensional digital filter for receiving inputs from at least two antenna elements and processing the inputs to produce a beamformed output, as claimed by applicant. However, this feature is taught by Velazquez, as discussed in the rejection of claim 5. Hence, claim 18 is rejected on the same ground and motivation as claim 5.

As per claim 19: the method further comprising:

weighting at least one of inputs and outputs of said at least two antenna elements to steer the resultant output beam of said at least one steerable N-dimensional array reads on '880 (see col. 13-30; col. 13, line 52-col. 14, line 10).

As per claim 23: the method further comprising arranging the at leastantenna elements in a two-dimensional plane or on a surface of a cylinder reads on '788 (see col. 15, line 55-col. 16, line 13).

As per claim 31: the base station wherein said steerable N-dimensional array means further includes:

a least two antenna elements reads on '060 (see col. 4, lines 21-29). But, Fujii in view of Keskitalo do not explicitly teach about N-dimensional digital filter means for receiving inputs from said at least two antenna elements and processing the inputs to produce a beamformed output, as claimed by applicant. However, this feature is taught by Velazquez, as discussed in the rejection of claim 5. Hence, claim 31 is rejected on the same ground and motivation as claim 5.

As per claim 32: the base station wherein at least one of inputs and outputs of said at least two antenna elements are weighted to steer a resultant output beam of said steerable N-dimensional array means reads on '880 (see col. 13-30; col. 13, line 52-col. 14, line 10).

As per claim 36: the base station wherein said at least two antenna elements are arranged in a two-dimensional plane or a surface of a cylinder reads on '788 (see col. 15, line 55-col. 16, line 13).

Claims 7, 9, 20, 22, 33 and 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fujii in view of Keskitalo and Velazquez as applied to claims discussed above, and further in view of Searle (US 4,743,871).

As per claim 7: but, the above cited references do not explicitly teach about weighting at least one of inputs and outputs of the at least two antenna elements using variable filter tap weights, as claimed by applicant. However, in a related field of endeavor,

Searle teaches about an adaptive filter that includes tapped delay line coupled to a signal input, and means for weighting the outputs of the tapped delay line and means for summing the weighted outputs (see fig. 2; col. 1, lines 25-40; col. 2, lines 41-55). Therefore, it would have been obvious for one of ordinary skill in the art at the time the invention was made to modify the above references with the teaching of Searle for the advantage of preventing the formation of nulls at the frequency of interest (see col. 1, lines 31-40).

As per claim 9: the base station wherein an angular speed spread and look direction of the resultant output beam of said at least one steer-able N-dimensional array are varied by varying a number of filter taps, reads on '871 (see Fig. 2; col. 1, lines 25-40; col. 2, lines 41-55). Fujii discloses, as disclosed above, a base station having two tilt antennas for hierarchical overlay and underlay cell cites. When Fujii's reference is modified, as discussed above, with the teaching of Keskitalo, the system will have a two dimensional array. As shown in the rejection of claim 7, the references of Fujii and Keskitalo can be further modified with a number of Searle's variable filter taps.

As per claim 20: but, the above cited references do not explicitly teach about a method of weighting the at least one of inputs and outputs of the at least two antenna elements using variable filter tap weights, as claimed by applicant. However, in a related field of endeavor, Searle teaches about an adaptive filter that includes tapped delay line coupled to a signal input, and means for weighting the outputs of the tapped delay line and means for summing the weighted outputs (see fig. 2; col. 1, lines 25-40; col. 2, lines 41-55). Therefore, it would have been obvious for one of ordinary skill in the art at the

time the invention was made to modify the above references with the teaching of Searle for the advantage of preventing the formation of nulls at the frequency of interest (see col. 1, lines 31-40).

As per claim 22: the method further comprising varying a number of filter taps of the resultant output beam of the at least one steerable N-dimensional array to vary an angular spread and look direction of the resultant output beam reads on '871 (see Fig. 2; col. 1, lines 25-40; col. 2, lines 41-55). Fujii discloses, as disclosed above, a base station having two tilt antennas for hierarchical overlay and underlay cell cites. When Fujii's reference is modified, as discussed above, with the teaching of Keskitalo, the system will have a two dimensional array. As shown in the rejection of claim 20, the references of Fujii and Keskitalo can be further modified with a number of Searle's variable filter taps. Furthermore, tilt/look and angular spread are obvious from the combination of the references used herein above.

As per claim 33: but, the above cited references do not explicitly teach about weighting at least one of inputs and outputs of the at least two antenna elements using variable filter tap weights, as claimed by applicant. However, in a related field of endeavor, Searle teaches about an adaptive filter that includes tapped delay line coupled to a signal input, and means for weighting the outputs of the tapped delay line and means for summing the weighted outputs (see fig. 2; col. 1, lines 25-40; col. 2, lines 41-55). Therefore, it would have been obvious for one of ordinary skill in the art at the time the invention was made to modify the above references with the teaching of Searle for the

advantage of preventing the formation of nulls at the frequency of interest (see col. 1, lines 31-40).

As per claim 35: the base station wherein an angular spread and look direction of the resultant output beam of said steerable N-dimensional array means are varied by varying a number of filter taps reads on '871 (see Fig. 2; col. 1, lines 25-40; col. 2, lines 41-55). Fujii discloses, as disclosed above, a base station having two tilt antennas for hierarchical overlay and underlay cell cites. When Fujii's reference is modified, as discussed above, with the teaching of Keskitalo, the system will have a two dimensional array. As shown in the rejection of claim 20, the references of Fujii and Keskitalo can be further modified with a number of Searle's variable filter taps. Furthermore, tilt/look and angular spread are obvious from the combination of the references used herein above.

Response to Arguments

Applicant's arguments with respect to claims 1-10, 12-23, 25-35 and 38-39 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Meless N Zewdu whose telephone number is (703) 306-5418. The examiner can normally be reached on 8:30 am to 5:00 pm..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, William Trost can be reached on (703) 308-5318. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 306-0377.

Meless Zewdu

Examiner

04 March 2004

WILLIAM TROST
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